TEST REPORT

DT&C Co., Ltd.
42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1709-0188(1)
2. Customer
   - Name (FCC) : POINTMOBILE CO., LTD. / Name (IC) : POINTMOBILE CO.,LTD
   - Address (FCC) : B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu Seoul South Korea 153-709
     Address (IC) : B-9F Kabul Great Valley, 32, Digital-ro 9-gil, Geumcheon-gu Seoul Korea (Republic Of)
3. Use of Report : FCC & IC Original Grant
4. Product Name / Model Name : Mobile Computer / FCC: PM70, IC: PM70W
   FCC ID: V2X-PM70W / IC: 10664A-PM70W
5. Test Method Used : ANSI C63.10-2013
   Test Specification : FCC Part 15.225
   RSS-210 Issue 9 (2016-04), RSS-GEN Issue 4 (2014-11)
6. Date of Test : 2017.07.20 ~ 2017.07.25
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : JaeHyeok Bang (Signature)	Technical Manager Name : GeunKi Son (Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2017 . 10 . 26 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1709-0188	Sep. 12, 2017	Initial issue
DRTFCC1709-0188(1)	Oct. 26, 2017	Add the test result

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1. General Information

1.1. Testing Laboratory

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The site is constructed in conformance with the requirements. **- FCC MRA Accredited Test Firm No. : KR0034** **- IC Test site No. : 5740A-2**		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2. Testing Environment

Ambient Condition	
▪ Temperature	+21 ℃ ~ 23 ℃
▪ Relative Humidity	40 % ~ 48 %

1.3. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Test items	Measurement uncertainty
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)

1.4. Details of Applicant

Applicant (FCC)	:	POINTMOBILE CO., LTD.
Applicant (IC)		POINTMOBILE CO.,LTD
Address (FCC)	:	B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu Seoul South Korea 153-709
Address (IC)		B-9F Kabul Great Valley, 32, Digital-ro 9-gil, Geumcheon-gu Seoul Korea (Republic Of)
Contact person (FCC)	:	Wilson Park
Contact person (IC)	:	Edgar Cho

1.5. Description of EUT

FCC Equipment Class	Low Power Communications Device Transmitter(DXX)
EUT	Mobile Computer
Model Name	FCC: PM70 IC: PM70W
Add Model Name	NA
Serial Number	Identical prototype
Hardware version	MP
Software version	70.00
Power Supply	DC 3.8 V
Frequency Band	13.56 MHz
Modulation Type	ASK
Channel(s)	1
Antenna type	Loop Antenna

2. Information about test items

2.1 Test mode

Test mode1	Continuous transmitting mode
Test mode2	-

Note: For this test mode, a test program was supported by manufacturer.

2.2 Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

2.3 Tested frequency

Channel	TX Frequency(MHz)	RX Frequency(MHz)
Lowest	13.56	13.56
Middle	-	-
Highest	-	-

2.4 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Antenna requirements

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

The antenna is attached to the battery cover, and it is coupled use the special tension.(Refer to Internal photo file)
Therefore this E.U.T Complies with the requirement of §15.203

4. Test report

4.1 Summary of tests

FCC part section(s)	RSS section(s)	Parameter	Limit	Test condition	Status Note 1
2.1049	-	20 dB Bandwidth	-	Radiated	C
-	RSS-Gen [6.6]	Occupied Bandwidth	-		C
15.225 (a)	RSS-210 [B6(a)]	In-Band Emissions	15,848 μV/m @ 30 m 13.553 – 13.567 MHz		C Note 2
15.225 (b)	RSS-210 [B6(b)]	In-Band Emissions	334 μV/m @ 30 m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		C Note 2
15.225 (c)	RSS-210 [B6(c)]	In-Band Emissions	106 μV/m @ 30 m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		C Note 2
15.225 (d) 15.209	RSS-210 [B6(d)] RSS-GEN [8.9]	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		C Note 2
15.225 (e)	RSS-210 [B6]	Frequency Stability	±0.01 % of operating frequency	Temp & Humid Test Chamber	C
15.207	RSS-Gen [8.8]	AC Conducted Emissions	FCC Part 15.207	AC Line Conducted	C
15.203	-	Antenna Requirements	FCC Part 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

4.2 Transmitter requirements

4.2.1 20dB bandwidth

- Procedure:

The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.
And spectrum analyzer setting use following test procedure of **ANCSI C63.10-2013 – Section 6.9.2.**

1. Center frequency = EUT channel center frequency
2. Span = 2 ~ 5 times the OBW
3. RBW = 1 % ~ 5 % OBW
4. VBW ≥ 3 x RBW
5. Detector = Peak
6. Trace = Max hold
7. The trace was allowed to stabilize
8. Determine the reference value = Set the spectrum analyzer marker to the highest level of the displayed trace
9. Using the marker-delta function of the instrument, determine the "−xx dB down amplitude" using [(reference value) − xx].
10. Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

- Measurement Data: Comply

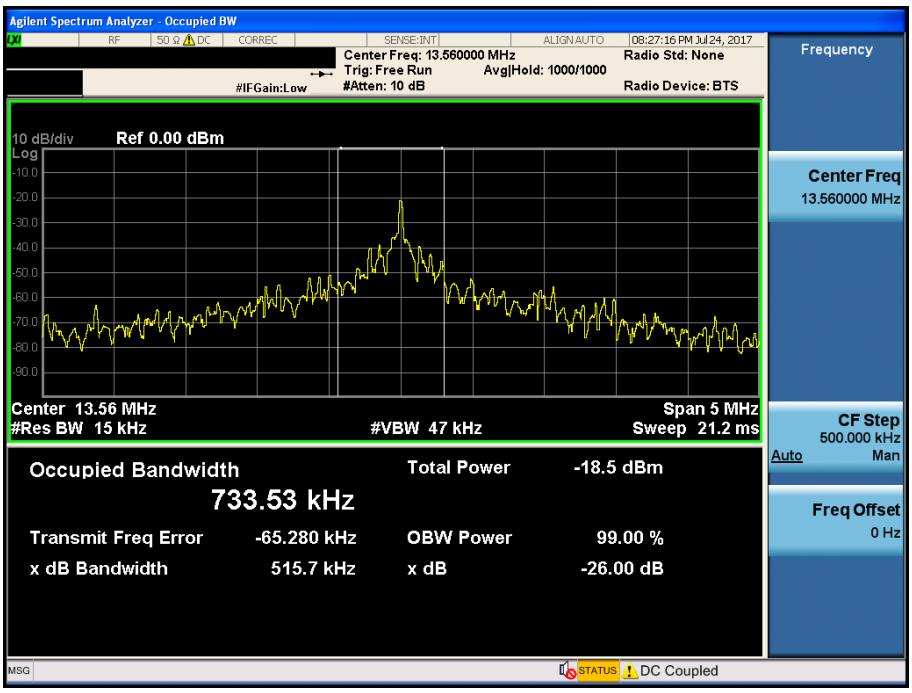
- Minimum Standard: NA

4.2.2 Occupied bandwidth

- Procedure:

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 x RBW.

- Measurement Data: Comply



- Minimum Standard: NA

4.2.3 In-band emissions

- Procedure:

The EUT was placed on a 0.8 m high non-conductive table inside a 3 m semi anechoic chamber. An antenna was placed at 3 m distance from the EUT Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

- Measurement Data: Comply

Tested Frequency : **13.56 MHz**

Measurement Distance : **3 Meters**

Test Frequency Band [MHz]	Freq. [MHz]	EUT Posi.	ANT Pol (Note 1)	Reading Level [dBuV]	T.F [dB/m]	Field Strength @3 m [dBuV/m]	Field Strength @30 m [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.110 ~ 13.410	13.348	Z	F	20.00	19.76	39.76	-0.24	40.51	40.75
13.410 ~ 13.553	13.553	Z	F	27.80	19.77	47.57	7.57	50.47	42.90
13.553 ~ 13.567	13.560	Z	F	37.40	19.77	57.17	17.17	84.00	66.83
13.567 ~ 13.710	13.568	Z	F	22.00	19.77	41.77	1.77	50.47	48.70
13.710 ~ 14.010	13.774	Z	F	18.40	19.78	38.18	-1.82	40.51	42.33

Note 1. This test item was performed using a loop antenna.
"F": = Facing the antenna / "T" = antenna shifted / turned 90s degrees [Loop antenna]

Note 2. This test item was performed at 3 m and the data were extrapolated to the specified measurement distance of 30 m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)2.

- Extrapolation Factor = 20 $\log_{10}(30/3)^2$ = 40 dB

Note 3. All data were recorded using a spectrum analyzer employing a peak detector.
If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

Note 4. Sample Calculation.

Margin = Limit – Field Strength @ 30 m / Field Strength @ 30 m = Field Strength @ 3 m – 40 dB

Field Strength @ 3 m = Reading + T.F / T.F = AF + CL – AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

- Minimum Standard: Part 15.225(a), (b), (c)& RSS-210 [B6(a), (b), (c)]

Frequency Band [MHz]	Limit	
	[uV/m]	[dBuV/m]
13.553-13.567	15,848	84.00
13.410-13.553 13.567-13.710	334	50.47
13.110-13.410 13.710-14.010	106	40.51

4.2.4 Out-of-band emissions

- Procedure:

The EUT was tested from 9 kHz up to the 1 GHz excluding the band 13.110-14.010 MHz. All measurements were recorded with spectrum analyzer employing a peak detector for emissions below 30 MHz. Above 30 MHz a Quasi-peak detector was used. All out-of-band emissions must not exceed the limits §15.209. A loop antenna was used for searching for emissions below 30 MHz.

- Measurement Data: Comply

Tested Frequency : **13.56 MHz**

Measurement Distance : **3 Meters**

Frequency [MHz]	EUT Posi.	ANT Pol (Note 1)	Reading [dBuV]	T.F [dB/m]	Distance factor [dB]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
0.514	Z	F	28.80	19.12	40.00	7.92	33.00	25.08
40.670	Y	V	43.20	-16.55	0.00	26.65	40.00	13.35
67.709	Y	V	43.00	-17.12	0.00	25.88	40.00	14.12
176.224	Z	V	37.70	-13.94	0.00	23.76	43.50	19.74
944.307	Y	V	34.60	5.06	0.00	39.66	46.00	6.34
*944.165 (Quasi-peak)	Y	V	32.80	5.06	0.00	37.86	46.00	8.14
991.484	Y	V	31.20	5.25	0.00	36.45	54.00	17.55

Note 1. "F": = Facing the antenna / "T" = antenna shifted / turned 90s degrees [Loop antenna]
"H": = Horizontal / "V" = Vertical [Bilog antenna]

Note 2. All measurements were recorded using a spectrum analyzer employing a peak detector for blew 30 MHz and a Quasi-peak detector for above 30 MHz.

Note 3. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 4. Sample calculation

Margin = Limit – Field Strength

Field Strength = Reading + T.F – Distance factor

T.F = AF + CL – AG

Distance factor = 20log(Measurement distance / The measured distance)^2

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

- Minimum Standard: Part 15.209, 225(d) & RSS-210[B6(d)], RSS-GEN[8.9]

▪ FCC Part 15.209(a):

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	200	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.209(b):

In the emission table above, the tighter limit applies at the band edges.

4.2.5 Frequency Stability

- Procedure:

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01 % of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

- Measurement Data: Comply

Operating Frequency : **13,560,000 Hz**

VOLTAGE (%)	POWER (V_{DC})	TEMP (℃)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.800	+20(ref)	13,559,358	-642	0.004735
100%		-20	13,559,341	-659	0.004862
100%		-10	13,559,344	-656	0.004842
100%		0	13,559,351	-649	0.004790
100%		+10	13,559,352	-648	0.004775
100%		+20	13,559,358	-642	0.004735
100%		+30	13,559,363	-637	0.004700
100%		+40	13,559,385	-615	0.004539
100%		+50	13,559,389	-611	0.004509
115%	4.370	+20	13,559,356	-644	0.004753
BATT.ENDPOINT	3.500	+20	13,559,358	-642	0.004738

- Minimum Standard: Part 15. 225(e) & RSS-210 [B6]

The frequency tolerance of the carrier signal shall be maintained within ±0.01 % of the operating frequency.

4.2.6 AC Line Conducted Emissions

- Test Requirements and limit

For an intentional radiator that is designed to be connected to the public utility (AC)power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

- Measurement Data: Comply (refer to the next page)

Measurement Data

Results of Conducted Emission

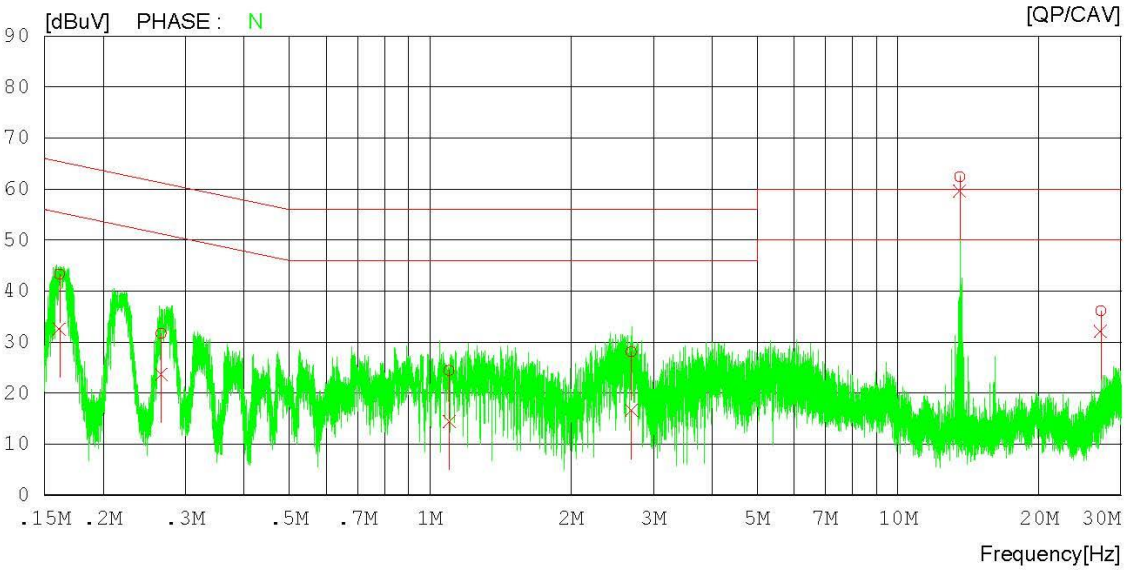
DT&C

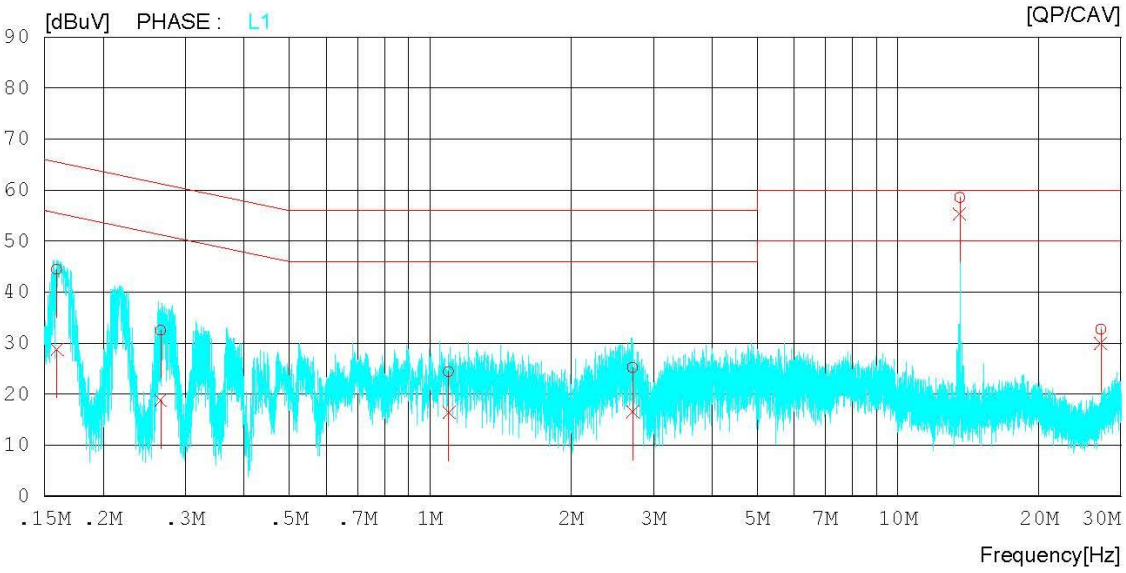
Date 2017-07-22

Model	PM70	Temp/Humi.	23 'C 48 %
Function	NFC	Power Supply	AC 120 V 60 Hz
Mode		Operator	J.W.Kim
Test condition			

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Measurement Data

Results of Conducted Emission

DT&C

Date 2017-07-22

Model	PM70	Temp/Humi.	23 'C 48 %
Function	NFC	Power Supply	AC 120 V 60 Hz
Mode		Operator	J.W.Kim
Test condition			

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ [MHz]	READING QP [dBuV]	READING CAV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT CAV [dBuV]	LIMIT QP [dBuV]	LIMIT CAV [dBuV]	MARGIN QP [dBuV]	MARGIN CAV [dBuV]	PHASE
1	0.16150	43.07	32.36	0.22	43.29	32.58	65.39	55.39	22.10	22.81	N
2	0.26638	31.54	23.50	0.21	31.75	23.71	61.23	51.23	29.48	27.52	N
3	1.09920	24.21	14.22	0.26	24.47	14.48	56.00	46.00	31.53	31.52	N
4	2.69520	27.74	16.26	0.34	28.08	16.60	56.00	46.00	27.92	29.40	N
5	13.55900	61.51	58.72	0.95	62.46	59.67	60.00	50.00	-2.46	-9.67	N
6	27.11880	34.29	30.19	1.87	36.16	32.06	60.00	50.00	23.84	17.94	N
7	0.15950	44.24	28.57	0.18	44.42	28.75	65.49	55.49	21.07	26.74	L1
8	0.26550	32.28	18.61	0.18	32.46	18.79	61.26	51.26	28.80	32.47	L1
9	1.09620	24.13	16.13	0.25	24.38	16.38	56.00	46.00	31.62	29.62	L1
10	2.70860	24.83	16.19	0.33	25.16	16.52	56.00	46.00	30.84	29.48	L1
11	13.55920	57.56	54.30	0.99	58.55	55.29	60.00	50.00	1.45	-5.29	L1
12	27.11920	30.60	27.74	2.13	32.73	29.87	60.00	50.00	27.27	20.13	L1

Measurement Data (With antenna Terminated)

Results of Conducted Emission

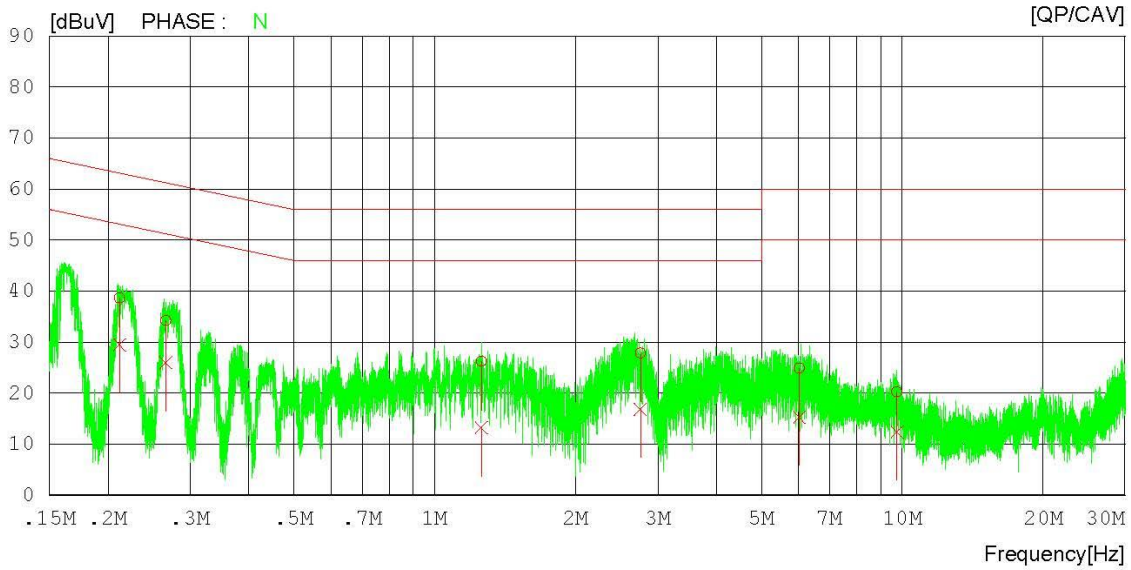
DT&C

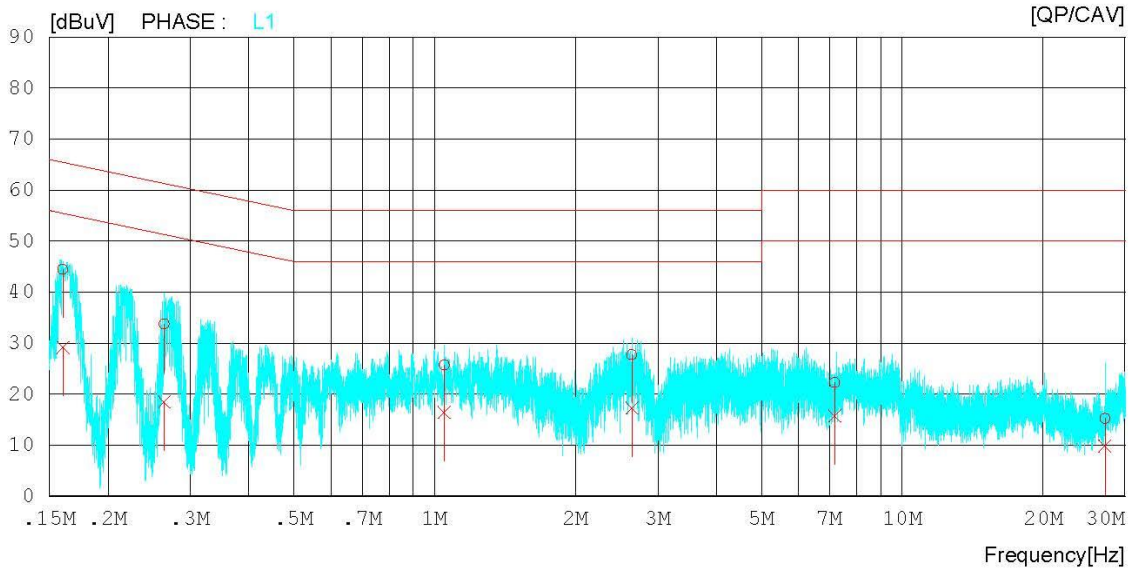
Date 2017-07-22

Model	PM70	Temp/Humi.	23 'C 48 %
Function	NFC	Power Supply	AC 120 V 60 Hz
Mode		Operator	J.W.Kim
Test condition			

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Measurement Data (With antenna Terminated)

Results of Conducted Emission

DT&C

Date 2017-07-22

Model	PM70	Temp/Humi.	23 'C 48 %
Function	NFC	Power Supply	AC 120 V 60 Hz
Mode		Operator	J.W.Kim
Test condition			

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ [MHz]	READING QP [dBuV]	READING CAV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT CAV [dBuV]	LIMIT QP [dBuV]	LIMIT CAV [dBuV]	MARGIN QP [dBuV]	MARGIN CAV [dBuV]	PHASE
1	0.21192	38.50	29.30	0.20	38.70	29.50	63.13	53.13	24.43	23.63	N
2	0.26627	34.02	25.72	0.21	34.23	25.93	61.23	51.23	27.00	25.30	N
3	1.25800	25.95	12.93	0.26	26.21	13.19	56.00	46.00	29.79	32.81	N
4	2.75340	27.51	16.57	0.35	27.86	16.92	56.00	46.00	28.14	29.08	N
5	6.02380	24.38	14.83	0.50	24.88	15.33	60.00	50.00	35.12	34.67	N
6	9.74700	19.48	11.68	0.70	20.18	12.38	60.00	50.00	39.82	37.62	N
7	0.16033	44.22	28.90	0.19	44.41	29.09	65.45	55.45	21.04	26.36	L1
8	0.26393	33.48	18.23	0.18	33.66	18.41	61.31	51.31	27.65	32.90	L1
9	1.04880	25.40	16.14	0.25	25.65	16.39	56.00	46.00	30.35	29.61	L1
10	2.64260	27.35	16.93	0.33	27.68	17.26	56.00	46.00	28.32	28.74	L1
11	7.17480	21.65	15.13	0.59	22.24	15.72	60.00	50.00	37.76	34.28	L1
12	27.12500	13.02	7.60	2.13	15.15	9.73	60.00	50.00	44.85	40.27	L1

APPENDIX

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	17/07/12	18/07/12	MY46471601
Spectrum Analyzer	Agilent Technologies	N9020A	16/10/11	17/10/11	MY46471251
Multimeter	FLUKE	17B	17/04/12	18/04/12	26030065WS
DC Power Supply	Agilent	66332A	17/01/11	18/01/11	US37473831
Signal Generator	Rohde Schwarz	SMBV100A	17/01/04	18/01/04	255571
Thermohygrometer	HCT	HCT-1	16/09/09	17/09/09	NONE
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	16/11/11	18/11/11	3151
PreAmplifier	TSJ	MLA-010K01-B01-27	17/03/06	18/03/06	1844539
EMI Test Receiver	Rohde Schwarz	ESR7	17/02/16	18/02/16	101061
EMI Test Receiver	R&S	ESCI	17/02/26	18/02/16	100364
SINGLE-PHASE MASTER	NF	4420	16/09/08	17/09/08	3049354420023
Temp & Humi Test Chamber	SJ Science	SJ-TH-S50	16/09/09	17/09/09	U5542113
Artificial Mains Network	Rohde Schwarz	ESH2-Z5	16/09/08	17/09/08	828739/006

Note: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2006.